FIG. **15** shows a purification cartridge for vaginal or cervical swab samples and FIG. **16** shows the macrofluidic portion of that cartridge. The microfluidic layers are essentially the same as those of FIGS. **9** and **10**.

The macrofluidic portion of the purification cartridge is composed of 7 chambers that hold preloaded reagent solutions or serve as holding/reaction chambers during the DNA purification process. One chamber is used to hold the cotton swab with the DNA sample; four chambers are pre-filled with 550 μL of lysis solution, 550 μL of absolute ethanol, 2 mL of wash buffer and 100 μL of TE (pH 8) elution buffer.

The purification process is initiated by simply pressing a button that starts the automated script that controls the pneumatic drive. The pneumatic drive applies the required pressures and vacuums for the required times to enable all process steps to be conducted automatically, without user intervention. Lysis solution is pneumatically driven from the lysis reagent reservoir [**52**] into the swab chamber [**50**] and brought in contact with the swab. Continued application of pneumatic drive through the lysis reservoir [**52**] after all lysis reagent has been dispensed will force air through swab chamber effect "chaotic bubbling" at 5 psi for 60 seconds. This bubbling creates turbulent flow around the swab head, mediating cell lysis and the removal of cellular material from the swab head. Ethanol from the ethanol reservoir [**51**] is driven into the swab chamber [**50**]. Continued application of pneumatic drive through the ethanol reservoir [**51**] after all the ethanol has been dispensed will force air through the lysate and ethanol solution to effect mixing by chaotic bubbling for 30 seconds. All the lysate and ethanol mixture is pneumatically driven through a particulate filter [**40**] into the holding chamber [**35**]. From the holding chamber [**35**] the lysate and ethanol mixture is pneumatically driven through the purification membrane and into the swab chamber [**50**]. The swab chamber now serves as a waste chamber for spent process reagents. Wash solution from wash reservoir [**47**] is pneumatically driven through the purification membrane and into the swab chamber [**50**]. Washing of the purification membrane with wash buffer is conducted to remove unbound material (including protein) and residual lysis solution. Continued application of pneumatic drive through the wash reservoir [**47**] after all the wash solution has been dispensed will force air through the purification filter and dry the filter for 105 seconds. Elution solution is pneumatically driven from the eluate reservoir [**49**] through the purification membrane to the eluate homogenization chamber [**48**]. Continued application of pneumatic drive through the eluate reservoir [**49**] after all elution solution has been dispensed will force air through eluate homogenization chamber [**48**] to effect mixing by chaotic bubbling. Homogenized purified DNA solution in the eluate homogenization chamber [**48**] is ready for subsequent analysis.

Total nucleic acid concentration is quantified by absorbance at 260 nm. Fast PCR amplification in biochip using fluorescently-labeled primer sets specific for sexually transmitted diseases (including *Chylamdia trachomatis*, human immunodeficiency virus, *Trichomonas vaginalis, Neisseria gonorrhoeae*) and electrophoretic separation and detection in Genebench generate bands characteristic of the pathogen causing either symptomatic or asymptomatic infection.

While these inventions have been particularly shown and described with references to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in the form and details may be made therein without departing from the spirit and scope of the inventions, as described in the appended claims.

The invention claimed is:

1. A self-contained apparatus for isolating nucleic acid from at least one unprocessed sample, said apparatus to be used with an instrument, said apparatus consisting of a macrofluidic component, a microfluidic component, at least one drive line, and two inputs, a first input for receiving at least one unprocessed sample from a collection device, and a second input for interfacing at least one drive mechanism on said instrument at, at least one port:

(i) said macrofluidic component consisting of: (a) at least one sample chamber each of said at least one sample chamber composed of said first input for receiving said at least one unprocessed sample from the collection device; (b) four reagent chambers, said first reagent chamber pre-filled with a lysis reagent, a second reagent chamber pre-filled with an ethanol reagent, a third reagent chamber pre-filled with a wash reagent, said fourth reagent chamber pre-filled with an elution reagent (c) an eluate homogenization chamber and (d) a holding chamber;

(ii) said microfluidic component comprising at least one microfluidic element, at least one particulate filter and at least one nucleic acid purification matrix, said microfluidic component in communication with said macrofluidic component via said at least one microfluidic element, and said at least one drive line;

(iii) said second input composed of at least one drive mechanism interface port for connection to said drive mechanism on said instrument configured to drive said lysis, ethanol, wash and elution reagents through said particulate filter and said nucleic acid purification matrix,

(iv) said at least one drive line in communication with said second input for interfacing with said at least one drive mechanism on said instrument and with said microfluidic component to supply controlled flow or controlled pressure or a controlled volumetric displacement of gas or liquid to the apparatus,

whereby in use, lysis reagent is driven from said first reagent chamber pre-filled with a lysis reagent into said at least one sample chamber, then ethanol is driven from said second chamber pre-filled with an ethanol reagent into said sample chamber, thereby resulting in a lysate and ethanol mixture in said at least one sample chamber, whereupon the lysate and ethanol mixture is driven through said particulate filter and into said holding chamber, then the lysate and ethanol mixture is driven thru the purification matrix into said at least one sample chamber, whereupon wash solution is driven from said third reagent chamber pre-filled with a wash reagent through said at least one nucleic acid purification matrix and into said at least one sample chamber, thereafter elution reagent is driven from said fourth reagent chamber pre-filled with an elution reagent through said at least one nucleic acid purification matrix into said eluate homogenization chamber, resulting in homogenized purified DNA solution in said eluate homogenization chamber.

2. The apparatus of claim **1** wherein said collection device and/or chamber is labeled with a bar code or RFID.

3. The apparatus of claim **1** wherein said drive mechanism is pneumatic, mechanical, magnetic, or fluidic.

4. The apparatus of claim **1** wherein the unprocessed sample is selected from the group consisting of: i) a nasal swab, nasopharyngeal swab, buccal swab, oral fluid swab, stool swab, tonsil swab, vaginal swab, cervical swab, blood swab, wound swab, or tube containing blood, sputum,